FSOC Fishway Description and Fish Use

Fishway Type	Description	Positives	Negatives	Fish Use
Vertical Slot	Swim through fishway that provides resting pools and slots that fish need to use a quick "burst" to swim through. The invert of each slot is set at a given height difference from that of the slot directly upstream.	*Self adjusting/self regulating *Provides resting areas (pools) *Swim through fishway that does not require a fish to leap *Passage can occur at any depth in the water column	*Slots can catch debris *Slot velocities and pool re-circulation can be difficult for weaker swimming fish *Large footprint and expensive *Uses lots of water so small stream application is difficult	Works well for: *Adult salmonids *Bull trout *Mountain Whitefish Can Work for (not optimal): *Suckers *Juvenile Salmonids (can have trouble with slot velocities and re-circulating currents)
Pool and Weir[1]	Fishway that utilizes plunging flow over weirs, separated by energy disspation pools. Each weir is set at a given height differental from the weir directly up or down stream. Fish pass by leaping over each weir.	*Can be designed to provide passage at a wide range of flows *Can be designed to use the least amount of water (great for low flow passage) *Provides resting areas *Most debris passes over top of weirs *Simple in design, less engineering than other fishways	*Requires manual adjustment of each weir if water surface elevations up and/or downstream change *Gravel and sediment can settle in pools *Fish are required to leap in order to pass, which could lead to increased chance of injury	Works well for: *Adult and juvenile salmon and steelhead (low jumps) Limited success for: *Bull trout *Mountain whitefish (behaviorally these fish tend not to jump) Does not work well for: *Chum salmon *Suckers *Other fish that do not leap.
Pool and Chute[1]	Hybrid fishway with both plunging flow and streaming flow at certain flows (namely the mid to higher flows). Primarily acts as a pool and weir at low flows. Works well for applications with limited project space and the structure spans the entire channel.	*Potentially small footprint (does not need to dissipate energy during high flows) *Potentially two methods of fish passage (leap over, or swim through) at certain flows. *Works at wide range of flows *Self adjusting *Strong attraction flow (when channel spanning)	*High turbulence during high flows *Limited resting areas for fish *Attraction can be an issue if not channel spanning *High degree of engineering needed to decipher plunging/streaming flow regime and correlate to fish passage *Passage provided at top of the water column only *Ladder must be straight (no turns) *Best for low head applications (<5-6 ft.)	Works well for: *All salmonid species and lifestages May not work for: *Chum salmon *Suckers (when in plunging regime)
Baffled Chute (denil and steeppass)	Baffled flumes that are designed to control depth and velocities by baffle dimensions and configuration. Baffles create turbulence that break up velocities for fish to swim through.	*Small and economical *Swim-through fishway which can provide "sweet spot" for passage *Steeppasses are portable and can be used at traps and in temporary capacities *Can be placed in steep configurations, gaining a lot of height in a short horizontal distance	*Very susceptible to debris *Cannot be used in locations where chute is downstream passage route *Due to high velocities, requires resting pools in larger installations *May use large quantities of water (depending on design) *Steeppass typically limited to temporary uses	Works well for: *Adult salmonids *Bull trout *Whitefish May work for (dependant on design/velocities): *Juveniles *Suckers *Other weaker swimming fish

1- Ladder may be designed with submerged orifice as well. An orifice requires additional water but allows fish to burst through the orifice lower in the water column. Submerged orifices are prone to plugging and are difficult to clean. They may not work well for fish with limited swimming capabilities.

FSOC Fishway Description and Fish Use (cont.)				
Fishway Type	**Description**	**Positives**	**Negatives**	**Fish Use**
Rock Weirs	"Nature" like fishway that utilizes boulders to create wiers and pools, much like a pool/weir or pool/chute fishway to provide passage. Typically fish are required to leap over weirs to pass, but generally both streaming and plunging flow regimes exist at certain flows.	*Natural in appearance *Dependant on design/flow, can provide both swim through and/or leap over passage. *Provides stream grade control *Can be partial width or channel spanning, though channel spanning is far preferred do to attraction and stability considerations	*Must be designed, engineered, constructed carefully and correctly *Longevity can be a concern, especially if rocks are not sized/designed correctly *Generally requires maintenance (debris removal, rock replacement) *Combination of sizing rock to withstand flood flows and provide passage sometimes does not pencil out *Low flow fish passage is a concern (sub-surface flow) *May not work downstream of reservoirs where fines settle out, or in any location devoid of fines.	Works well for: *Most salmonid species and lifestages May not work for: *Chum salmon *Suckers *Mountain whitefish (when in plunging regime)
Roughened Channel	"Nature" like fishway that utilizes natural aspects of a stream, such as riffles and pools, to provide passage. Typically, roughened channels are "over-steepened" and "over roughened" as compared to the natural gradient and pebble size.	*Natural in appearance *Utilizes "natural" stream hydrology to provide passage *Allows for natural function and passage of sediment *Can be partial width or channel spanning, though channel spanning is far preferred do to attraction considerations	*Difficult to construct, need a high level of design/engineering to be successful *If not designed/constructed correctly, both fish passage and longevity are at risk *Requires a lot of rock and streambed materials. Sometimes at a high cost. *Only applicable in low head installations (5ft - 6ft or less) *May not work downstream of reservoirs where fines settle out, or in any location devoid of fines.	Fish passability is determined by the details of the design. If built correctly to utilize roughness and slope that provide adequate depths and velocities, can pass all species and lifestages in need of passage at a given site.
Ice Harbor and Half Ice Harbor	Fishway that utilizes both pool and weir, as well as submerged orifice. Full ice harbor has partition between two weirs/orifices. Half ice harbor is full ice harbor cut in half (partition on one side, one weir w/ orifice on the other). Passage through this fishway is through either leaping over the weir or swimming through the orifice.	*Offers two routes of passage for fish that may prefer to either leap over the weir or burst through the orifice. *Best used at sites with good water supply and consistent reservoir and forebay levels.	*Large footprint *Requires a lot of water and stable flows *Submerged orifices are prone to plugging and are hard to clean	Works well for: *All salmonid species and lifestages May not work for: *Suckers *Other weaker swimming fish that don't jump with limited burst capabilities

There are many variations to each one of these fishways. These comments are general characterizations regarding performance and fish use, and they do not universally apply. Each site is different, and one design may work well for fish while in other locations the same design may not.